Final

Site Investigation Report
Former Printing Plant, Building 1060
Parcel 172(7)

Fort McClellan
Calhoun County, Alabama

Prepared for:

U.S. Army Corps of Engineers, Mobile District
109 St. Joseph Street
Mobile, Alabama 36602

Prepared by:

IT Corporation
312 Directors Drive
Knoxville, Tennessee 37923

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Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK05, IT Corporation completed a site investigation (SI) at the Former Printing Plant, Building 1060, Parcel 172(7), at Fort McClellan in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site and, if present, whether the concentrations present an unacceptable risk to human health or the environment. The SI at the Former Printing Plant, Building 1060, Parcel 172(7), consisted of the sampling and analysis of four surface soil samples, four subsurface soil samples, one surface water sample, and one sediment sample.

The analytical results indicate that metals, volatile organic compounds, and semivolatile organic compounds (SVOC) were detected in the environmental media sampled. To evaluate whether the detected constituents present an unacceptable risk to human health or the environment, the analytical results were compared to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values.

The potential impact to human receptors is expected to be minimal. Although the site is projected to be transferred to the Alabama National Guard, the soils data were screened against residential human health SSSLs to evaluate the site for possible unrestricted future use. With the exception of iron in one subsurface soil sample, the metals that exceeded SSSLs were below their respective background concentrations or within the range of background values and thus do not pose an unacceptable risk to future human receptors. Six polynuclear aromatic hydrocarbon (PAH) compounds were detected in two surface soil samples at concentrations exceeding SSSLs and PAH background values. One PAH compound (benzo[a]pyrene) exceeded the SSSL in one subsurface soil sample. The concentration of the PAHs exceeding SSSLs ranged from 0.12 milligrams per kilogram (mg/kg) to 11 mg/kg.

Several metals were detected in site media at concentrations exceeding ESVs and background concentrations. In addition, the concentrations of eight PAH compounds exceeded ESVs at two sampling locations. However, the potential impact to ecological receptors is expected to be minimal. The site is located in a well-developed area of the Main Post consisting of buildings and paved roads and is projected for use by the Alabama National Guard. Consequently, the threat to potential ecological receptors is expected to be low.

Based on the results of the SI, past operations at the Former Printing Plant, Building 1060, Parcel 172(7), do not appear to have adversely impacted the environment. The metals and organic compounds detected in site media do not pose an unacceptable risk to human health or the environment. Therefore, IT Corporation recommends "No Further Action" and unrestricted land reuse at the Former Printing Plant, Building 1060, Parcel 172(7).

1.0 Introduction

The U.S. Army has selected Fort McClellan (FTMC) located in Calhoun County, Alabama, for closure by the Base Realignment and Closure (BRAC) Commission under Public Laws 100-526 and 101-510. The 1990 Base Closure Act, Public Law 101-510, established the process by which U.S. Department of Defense (DOD) installations would be closed or realigned. The BRAC Environmental Restoration Program requires investigation and cleanup of federal properties prior to transfer to the public domain. The U.S. Army is conducting environmental studies of the impact of suspected contaminants at parcels at FTMC under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE contracted with IT Corporation (IT) to perform the site investigation (SI) at the Former Printing Plant, Building 1060, Parcel 172(7), under Contract Number DACA21-96-D-0018, Task Order CK05.

This SI report presents specific information and results compiled from the SI, including field sampling and analysis activities, conducted at the Former Printing Plant, Building 1060, Parcel 172(7).

1.1 Project Description

The Former Printing Plant, Building 1060 was identified as an area to be investigated prior to property transfer. The site was classified as a Category 7 site in the environmental baseline study (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 sites are areas that are not evaluated and/or that require further evaluation.

A site-specific field sampling plan (SFSP) attachment (IT, 1998a) and a site-specific safety and health plan (SSHP) attachment were finalized in December 1998. The SFSP and SSHP were prepared to provide technical guidance for sample collection and analysis at the Former Printing Plant, Building 1060, Parcel 172(7). The SFSP was used in conjunction with the SSHP as attachments to the installation-wide work plan (WP) (IT, 1998b) and the installation-wide sampling and analysis plan (SAP) (IT, 2000a). The SAP includes the installation-wide safety and health plan (SHP) and quality assurance plan (QAP).

The SI included field work to collect four surface soil samples, four subsurface soil samples, one sediment sample, and one surface water sample to determine if potential site-specific chemicals (PSSC) are present at the Former Printing Plant, Building 1060, Parcel 172(7), and to provide data useful for supporting any future corrective measures and closure activities.

1.2 Purpose and Objectives

The SI program was designed to collect data from site media and provide a level of defensible data and information in sufficient detail to determine whether chemical constituents are present at the Former Printing Plant, Building 1060, Parcel 172(7), at concentrations that present an unacceptable risk to human health or the environment. The conclusions of the SI in Chapter 6.0 are based on the comparison of the analytical results to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for FTMC. The SSSLs and ESVs were developed by IT as part of the human health and ecological risk evaluations associated with SIs being performed under the BRAC Environmental Restoration Program at FTMC. The SSSLs, ESVs, and polynuclear aromatic hydrocarbon (PAH) background screening values are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). The PAH background screening values were developed by IT at the direction of the BRAC Cleanup Team to address the occurrence of PAH compounds in surface soils as a result of anthropogenic activities at FTMC. Background metals screening values are presented in the *Final Background Metals Survey Report, Fort McClellan, Alabama* (Science Applications International Corporation [SAIC], 1998).

Based on these conclusions, the BRAC Cleanup Team will decide either to propose "No Further Action" at this site or to conduct additional work at the site.

1.3 Site Description and History

Building 1060 is located off of Rice Road at the north end of the Golf Course in the northwestern portion of the FTMC Main Post (Figures 1-1 and 1-2). Originally built in 1954, Building 1060 was the former location of the Headquarters of the Chemical Battalion at FTMC (ESE, 1998). Printing operations were historically conducted at four locations at FTMC, including Building 1060. Printing operations at Building 1060 began sometime after 1954 (exact year unknown) and continued until 1973 (ESE, 1998). The building is located on a small sparsely-wooded hill. A topographically low area, where surface water runoff accumulates, is located at the base of the hill, approximately 225 feet southeast of Building 1060 (Figure 1-2). Additional information concerning this location was not identified during the EBS (ESE, 1998).

The elevation at the Former Printing Plant, Building 1060, Parcel 172(2), is approximately 800 feet above mean sea level.

2.0 Previous Investigations

An EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The study was to identify sites that, based on available information, have no history of contamination and comply with DOD guidance for fast-track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by seven criteria:

1. Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas)

2. Areas where only release or disposal of petroleum products has occurred

3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response

4. Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken

5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken

6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented

7. Areas that are not evaluated or require additional evaluation.

The EBS was conducted in accordance with the Community Environmental Response Facilitation Act (CERFA) (CERFA-Public Law 102-426) protocols and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, the Alabama Department of Environmental Management (ADEM), the U. S. Environmental Protection Agency (EPA) Region IV, and Calhoun County, as well as a database search of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-regulated substances, petroleum products, and Resource Conservation and Recovery Act (RCRA)-regulated facilities. Available historical maps and aerial photographs

were reviewed to document historical land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels.

Previous studies to document site environmental conditions at the Former Printing Plant, Building 1060, Parcel 172(7), have not been conducted. Therefore, the site was classified as a Category 7 CERFA site: areas that are not evaluated or require additional evaluation.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by IT at the Former Printing Plant, Building 1060, Parcel 172(7), including environmental sampling and analysis activities.

3.1 Environmental Sampling

The environmental sampling performed during the SI at the Former Printing Plant, Building 1060, Parcel 172(7), included the collection of surface soil samples, subsurface soil samples, one surface water sample, and one sediment sample for chemical analysis. The sample locations were determined by observing site physical characteristics during a site walkover and by reviewing historical documents pertaining to activities conducted at the site. The sample locations, media, and rationale are summarized in Table 3-1. Sampling locations are shown on Figure 3-1. Samples were submitted for laboratory analysis of site-related parameters listed in Section 3.3.

3.1.1 Surface Soil Sampling

Surface soil samples were collected from four locations at the Former Printing Plant, Building 1060, Parcel 172(7), as shown on Figure 3-1. Soil sampling locations and rationales are presented in Table 3-1. Sample designations and quality assurance/quality control (QA/QC) samples are listed in Table 3-2. Soil sampling locations were determined in the field by the on-site geologist based on the sampling rationale, presence of surface structures, site topography, and proximity to utilities.

Sample Collection. Surface soil samples were collected from the upper 1 foot of soil with a 3-inch diameter stainless-steel hand auger using the methodology specified in Section 4.9.1.1 of the SAP (IT, 2000a). Surface soil samples were collected by first removing surface debris, such as rocks and vegetation, from the immediate sample area. The soil was collected with the sampling device and screened with a photoionization detector (PID) in accordance with Section 4.7.1.1 of the SAP (IT, 2000a). Samples for volatile organic compound (VOC) analysis were collected directly from the sampler with three EnCore® samplers. The remaining portion of the sample was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.3. Sample collection logs are included in Appendix A.

Table 3-1

Sampling Locations and Rationale
Former Printing Plant, Building 1060, Parcel 172(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
PPMP-172-GP01	Surface soil Subsurface soil	Surface soil and subsurface soil samples were collected near doors located on the northern side of Building 1060.
PPMP-172-GP02	Surface soil Subsurface soil	Surface soil and subsurface soil samples were collected near doors located near the northeastern corner of Building 1060.
PPMP-172-GP03	Surface soil Subsurface soil	Surface soil and subsurface soil samples were collected near doors located near the southeastern corner of Building 1060.
PPMP-172-GP04	Surface soil Subsurface soil	Surface soil and subsurface soil samples were collected near the front entrance on the western side of Building 1060.
PPMP-172-SD01	Sediment	A sediment sample was collected from a surface water runoff accumulation area southeast of Building 1060.
PPMP-172-SEP01	Surface water	A surface water sample was collected from a surface water runoff accumulation area southeast of Building 1060.

Table 3-2

Surface and Subsurface Soil Sample Designations and QA/QC Samples
Former Printing Plant, Building 1060, Parcel 172(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft. bgs)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
PPMP-172-GP01	PPMP-172-GP01-SS-KW0001-REG	0-1	PPMP-172-GP01-SS-KW0002-FD	PPMP-172-GP01-SS-KW0003-FS		TCL VOCs, TCL SVOCs, TAL Metals
	PPMP-172-GP01-DS-KW0004-REG	9-12				
PPMP-172-GP02	PPMP-172-GP02-SS-KW0005-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals
	PPMP-172-GP02-DS-KW0006-REG	9-12			PPMP-172-GP02-DS-KW0006-MS PPMP-172-GP02-DS-KW0006-MSD	
PPMP-172-GP03	PPMP-172-GP03-SS-KW0007-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals
	PPMP-172-GP03-DS-KW0008-REG	3-6				
PPMP-172-GP04	PPMP-172-GP04-SS-KW0009-REG	0-1				TCL VOCs, TCL SVOCs, TAL Metals
	PPMP-172-GP04-DS-KW0010-REG	3-6				

FD - Field duplicate.
FS - Field split.
ft. bgs - feet below ground surface.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
TOC - Total organic carbon.
VOC - Volatile organic compound.

3.1.2 Subsurface Soil Sampling

Subsurface soil samples were collected from four soil borings at the Former Printing Plant, Building 1060, Parcel 172(7), as shown on Figure 3-1. Subsurface soil sampling locations and rationale are presented in Table 3-1. Subsurface soil sample designations, depths, and QA/QC samples are listed in Table 3-2. Soil boring sampling locations were determined in the field by the on-site geologist based on the sampling rationale, presence of surface structures, site topography, and buried and overhead utilities. IT contracted TEG, Inc., a direct-push technology subcontractor, to assist in subsurface soil sample collection.

Sample Collection. Subsurface soil samples were collected from soil borings at depths greater than 1 foot below ground surface (bgs) in the unsaturated zone. The soil borings were advanced and soil samples collected using the direct-push sampling procedures specified in Section 4.9.1.1 of the SAP (IT, 2000a). Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.3.

Soil samples were collected continuously to 12 feet bgs or until direct-push sampler refusal was encountered. Subsurface soil samples were field screened using a PID in accordance with Section 4.7.1.1 of the SAP (IT, 2000a) to measure for volatile organic vapors. The sample displaying the highest reading was selected and sent to the laboratory for analysis; however, at those locations where the PID readings were not greater than background, the deepest sample interval above the saturated zone was submitted for analysis. Samples to be analyzed for VOCs were collected directly from the sampler with three EnCore samplers. The remaining portion of the sample was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. Samples submitted for laboratory analysis are summarized in Table 3-2. The on-site geologist completed a detailed boring log for each soil boring. The lithological log for each borehole is included in Appendix B.

At the completion of soil sampling, boreholes were abandoned with bentonite pellets hydrated with potable water, following borehole abandonment procedures summarized in Appendix B of the SAP (IT, 2000a).

3.1.3 Surface Water Sampling

One surface water sample was collected at the Former Printing Plant, Building 1060, Parcel 172(7), at the location shown on Figure 3-1. The surface water sampling location and rationale is listed in Table 3-1. The surface water sample designation and QA/QC samples are listed in

Table 3-3. The sampling location was determined in the field based on drainage pathways and actual field observations. This sample was originally planned in the SFSP as a seep water sample; however, based on field observations, the sample location was chosen to be a surface water runoff accumulation area.

Sample Collection. The surface water sample was collected in accordance with the procedures specified in Section 4.9.1.3 of the SAP (IT, 2000a). The sample was collected by dipping a stainless-steel pitcher in the water and pouring the water into the appropriate sample containers. The surface water sample was collected after field parameters had been measured using a calibrated water-quality meter. Surface water field parameters are listed in Table 3-4. Sample collection logs are included in Appendix A. The sample was analyzed for the parameters listed in Table 3-3 using methods outlined in Section 3.3.

3.1.4 Sediment Sampling

One sediment sample was collected at the Former Printing Plant, Building 1060, Parcel 172(7), at the location shown on Figure 3-1. The sediment sampling location and rationale is listed in Table 3-1. The sediment sample designation is listed in Table 3-3. The sampling location was determined in the field based on drainage pathways and actual field observations.

Sample Collection. The sediment sample was collected in accordance with the procedures specified in Section 4.9.1.2 of the SAP (IT, 2000a). Sediment was collected with a stainless-steel spoon and placed in a clean stainless-steel bowl. Samples for VOC analysis were then immediately collected from the stainless-steel bowl with three EnCore samplers. The remaining portion of the sample was homogenized and placed in the appropriate sample containers. Sample collection logs are included in Appendix A. The sediment sample was analyzed for the parameters listed in Table 3-3 using methods outlined in Section 3.3.

3.2 Surveying of Sample Locations

Sample locations were surveyed using global positioning system survey techniques described in Section 4.3 of the SAP (IT, 2000a) and conventional civil survey techniques described in Section 4.19 of the SAP (IT, 2000a). Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum, 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix C.

Table 3-3

Surface Water and Sediment Sample Designations and QA/QC Samples
Former Printing Plant, Building 1060, Parcel 172(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft. bgs)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
PPMP-172-SW/SD01	PPMP-172-SW/SD01-SD-KW1001-REG	0-0.5				TCL VOCs, TCL SVOCs, TAL Metals TOC, Grain size
PPMP-172-SEP01	PPMP-172-SW/SD01-SW-KW2001-REG	NA	PPMP-172-SW/SD01-SW-KW2002-FD	PPMP-172-SW/SD01-SW-KW2003-FS	PPMP-172-SW/SD01-SW-KW2001-MS PPMP-172-SW/SD01-SW-KW2001-MSD	TCL VOCs, TCL SVOCs, TAL Metals

FD - Field duplicate.
FS - Field split.
ft. bgs - feet below ground surface.
MS/MSD - Matrix spike/matrix spike duplicate.
NA - Not applicable.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SEP - Seep water sample (surface water).
SVOC - Semivolatile organic compound.
SW/SD - Surface water/sediment sample.
TAL - Target analyte list.
TCL - Target compound list.
TOC - Total organic carbon.
VOC - Volatile organic compound.

Table 3-4

Surface Water Field Parameters
Former Printing Plant, Building 1060, Parcel 172(7)
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Date	Media	Specific Conductivity (mS/cm)[a]	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (^{o}C)	Turbidity (NTU)	pH (SU)
PPMP-172-SEP01	2/10/1999	SW	0.090	8.04	200	15.69	35.2	6.44

[a] Specific conductivity value standardized to millisiemens per centimeter.

^{o}C - Degrees Celsius.
GW - Groundwater.
mg/L - Milligrams per liter.
mS/cm - Millisiemens per centimeter.
mV - Millivolts.
NR - Not recorded.
NTU - Nephelometric turbidity units.
ORP - Oxidation-reduction potential.
SU - Standard units.
SW - Surface water.

3.3 Analytical Program

Samples collected during the SI were analyzed for various chemical and physical parameters. The specific suite of analyses performed was based on the PSSC historically at the site and EPA, ADEM, FTMC, and USACE requirements. Samples collected at the Former Printing Plant, Building 1060, Parcel 172(7), were analyzed for the following parameters:

- Target compound list (TCL) VOCs - EPA Method 5035/8260B
- TCL semivolatile organic compounds (SVOC) - EPA Method 8270C
- Target analyte list metals - EPA Method 6010B/7000
- Total organic carbon - EPA Method 9060 (sediment only)
- Grain size - American Society for Testing and Materials Method D421/D422 (sediment only).

With the exception of grain size, the samples were analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Table 6-1 in Appendix B of the SAP (IT, 2000a). Data were reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of Appendix B of the SAP [IT, 2000a]). Chemical data were reported via hard-copy data packages by the laboratory using Contract Laboratory Program-like forms. These packages were validated in accordance with EPA National Functional Guidelines by Level III criteria. A summary of validated data is included in Appendix D. The Data Validation Summary Report is included as Appendix E.

3.4 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping followed requirements specified in Section 4.13.2 of the SAP (IT, 2000a). Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SI are listed in Section 5.0, Table 5-1, of Appendix B of the SAP (IT, 2000a). Sample documentation and chain-of-custody forms were recorded as specified in Section 4.13 of the SAP (IT, 2000a).

Completed analysis request and chain-of-custody records (Appendix A) were secured and included with each shipment of sample coolers to Quanterra Environmental Services in

Knoxville, Tennessee. Split samples were shipped to the USACE South Atlantic Division Laboratory in Marietta, Georgia.

3.5 Investigation-Derived Waste Management and Disposal

Investigation-derived waste (IDW) was managed and disposed as outlined in Appendix D of the SAP (IT, 2000a). The IDW generated during the SI at the Former Printing Plant, Building 1060, Parcel 172(7), was segregated as follows:

- Soil boring cuttings
- Decontamination fluids
- Personal protective equipment (PPE).

Solid IDW was stored inside the fenced area surrounding Buildings 335 and 336 in lined roll-off bins prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure analyses. Based on the results, soil boring cuttings and PPE generated during the SI at the Former Printing Plant, Building 1060, Parcel 172(7), was disposed as nonregulated waste at the Industrial Waste Landfill on the Main Post of FTMC.

Liquid IDW was contained in the existing 20,000-gallon sump associated with the Building T-338 vehicle washrack. Liquid IDW was characterized by VOC, SVOC, and metals analyses. Based on the analyses, liquid IDW was discharged as nonregulated waste to the FTMC wastewater treatment plant on the Main Post.

3.6 Variances/Nonconformances

There were not any variances or nonconformances to the SFSP recorded during completion of the SI at the Former Printing Plant, Building 1060, Parcel 172(7).

3.7 Data Quality

The field sample analytical data are presented in tabular form in Appendix D. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the SI WP; the FTMC SAP and QAP; and standard, accepted methods and procedures. Sample collection logs pertaining to the collection of these samples were reviewed and organized for this report and are included in Appendix A. As discussed in Section 3.6, there were not any variances or nonconformances to the SFSP recorded.

Data Validation. A complete (100 percent) Level III data validation effort was performed on the reported analytical data. Appendix E consists of a data validation summary report that was prepared to discuss the results of the validation. Selected results were rejected or otherwise qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the FTMC IT Environmental Management System™ (ITEMS) database for tracking and reporting. The qualified data were used in the comparisons to the SSSLs and ESVs. Rejected data (assigned an "R" qualifier) were not used in the comparisons to the SSSLs and ESVs.

The data presented in this report, except where qualified, meet the principle data quality objective for this SI.

4.0 Site Characterization

Subsurface investigations performed at the Former Printing Plant, Building 1060, Parcel 172(7), provided surface and subsurface soil data. Since there were not any wells installed at the site, a hydrogeological characterization was not performed. The regional geology has been described by others, as presented in the following section.

4.1 Regional and Site Geology

4.1.1 Regional Geology

Calhoun County includes parts of two physiographic provinces: the Piedmont Upland Province, and the Valley and Ridge Province. The Piedmont Upland Province occupies the extreme eastern and southeastern portions of the county and is characterized by metamorphosed sedimentary rocks. The generally accepted range in age of these metamorphics is Cambrian to Devonian.

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold-and-thrust structural belt (Valley and Ridge Province) where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold-and-thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted, with major structures and faults striking in a northeast-southwest direction.

Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults, and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992), and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group consists of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984) but in Calhoun County is either undifferentiated or divided into the Cochran and Nichols Formations and an upper, undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and

conglomerate with interbeds of greenish-gray siltstone and mudstone. Massive to laminated, greenish-gray and black mudstone makes up the Nichols Formation, with thin interbeds of siltstone and very fine-grained sandstone (Szabo et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies appears to dominate the units and consists primarily of coarse-grained, vitreous quartzite, and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consists of sandy and micaceous shale and silty, micaceous mudstone, which are locally interbedded with the coarse clastic rocks. The abundance of orthoquartzitic sandstone and quartzite suggests that most of the Chilhowee Group bedrock in the vicinity of FTMC belongs to the Weisner Formation (Osborne and Szabo, 1984).

The Cambrian Shady Dolomite overlies the Weisner Formation northeast, east, and southwest of the Main Post and consists of interlayered bluish-gray or pale yellowish-gray sandy dolomitic limestone and siliceous dolomite with coarsely crystalline porous chert (Osborne et al., 1989). A variegated shale and clayey silt have been included within the lower part of the Shady Dolomite (Cloud, 1966). Material similar to this lower shale unit was noted in core holes drilled by the Alabama Geologic Survey on FTMC (Osborne and Szabo, 1984). The character of the Shady Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval are still uncertain (Osborne, 1999).

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southeast of the Main Post as mapped by Warman and Causey (1962) and Osborne and Szabo (1984), and immediately to the west of Reilly Airfield (Osborne and Szabo, 1984). The Rome Formation consists of variegated, thinly interbedded grayish-red-purple mudstone, shale, siltstone, and greenish-red and light gray sandstone, with locally occurring limestone and dolomite. The Conasauga Formation overlies the Rome Formation and occurs along anticlinal axes in the northeastern portion of Pelham Range (Warman and Causey, 1962; Osborne and Szabo, 1984) and the northern portion of the Main Post (Osborne et al., 1997). The Conasauga Formation is composed of dark-gray, finely to coarsely crystalline medium- to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989).

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge

and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weather to a chert residuum (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite. The Little Oak Limestone is comprised of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped together as undifferentiated at FTMC and other parts of Calhoun County. The Athens Shale overlies the Ordovician limestone units. The Athens Shale consists of dark-gray to black shale and graptolitic shale with localized interbedded dark gray limestone (Osborne et al., 1989). These units occur within an eroded "window" in the uppermost structural thrust sheet at FTMC and underlie much of the developed area of the Main Post.

Other Ordovician-aged bedrock units mapped in Calhoun County include the Greensport Formation, Colvin Mountain Sandstone, and Sequatchie Formation. These units consist of various siltstones, sandstones, shales, dolomites, and limestones, and are mapped as one undifferentiated unit in some areas of Calhoun County. The only Silurian-age sedimentary formation mapped in Calhoun County is the Red Mountain Formation. This unit consists of interbedded red sandstone, siltstone, and shale with greenish-gray to red silty and sandy limestone.

The Devonian Frog Mountain Sandstone consists of sandstone and quartzitic sandstone with shale interbeds, dolomudstone, and glauconitic limestone (Szabo et al., 1988). This unit locally occurs in the western portion of Pelham Range.

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark- to light-gray limestone with abundant chert nodules and greenish-gray to grayish-red phosphatic shale, with increasing amounts of calcareous chert toward the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned

the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale on the basis of fossil data.

The Jacksonville Thrust Fault is the most significant structural geologic feature in the vicinity of FTMC, both for its role in determining the stratigraphic relationships in the area and for its contribution to regional water supplies. The trace of the fault extends northeastward for approximately 39 miles between Bynum, Alabama and Piedmont, Alabama. The fault is interpreted as a major splay of the Pell City Fault (Osborne and Szabo, 1984). The Ordovician sequence that makes up the Eden thrust sheet is exposed at FTMC through an eroded "window," or "fenster," in the overlying thrust sheet. Rocks within the window display complex folding, with the folds being overturned and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome Formation, north by the Conasauga Formation, northeast, east, and southwest by the Shady Dolomite, and southeast and southwest by the Chilhowee Group (Osborne et al., 1997).

4.1.2 Site Geology

Soils at the Former Printing Plant, Building 1060, Parcel 172(7), are composed of the Montevallo shaly, silty clay loam, 10 to 40 percent slopes, severely eroded (MtD3). This mapping unit consists of soils that have developed in residuum of interbedded shale and fine-grained sandstone or limestone. Erosion has removed all or nearly all of the original surface soil (U.S. Department of Agriculture, 1961).

The Former Printing Plant, Building 1060, Parcel 172(7), is situated in the northwestern portion of the Ordovician window in the uppermost thrust sheet. Bedrock beneath the site is mapped as Mississippian/Ordovician Floyd and Athens Shale, undifferentiated.

Based on direct-push boring data collected during the SI, residuum beneath the Former Printing Plant, Building 1060, Parcel 172(7), consists of predominantly red to brown sands overlying red to gray weathered shale. The weathered shale was encountered at depths ranging from 10.5 to 11.5 feet bgs at the Former Printing Plant, Building 1060, Parcel 172(7). The contact between the residuum and the weathered shale is generally gradual. Hard, competent bedrock was not encountered in the borings installed at the Former Printing Plant, Building 1060, Parcel 172(7).

4.2 Site Surface Hydrology

Precipitation in the form of rainfall averages about 54 inches annually in Anniston, Alabama, with infiltration rates annually exceeding evapotranspiration rates. The major surface water features at the Main Post of FTMC include Remount Creek, Cane Creek, and Cave Creek. These waterways flow in a general northwest to westerly direction towards the Coosa River on the western boundary of Calhoun County.

The ground surface at the Former Printing Plant, Building 1060 slopes primarily to the east/southeast, and surface water drainage is controlled by the site topography. The nearest surface water sources to the site are Cave Creek, located approximately 2,000 feet to the northeast, and Cane Creek, located approximately 2,500 feet to the southwest.

5.0 Summary of Analytical Results

The results of the chemical analysis of samples collected at the Former Printing Plant, Building 1060, Parcel 172(7), indicate that metals, VOCs, and SVOCs have been detected in the various site media. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, the analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC.

Metals concentrations exceeding the SSSLs and ESVs were subsequently compared to background metals screening values (SAIC, 1998) to determine if the metals concentrations are within natural background concentrations. Summary statistics for background metals samples collected at FTMC (SAIC, 1998) are included in Appendix F. Additionally, PAH compound concentrations in surface soils that exceeded the SSSLs and ESVs were compared to PAH background screening values. The PAH background screening values were derived from PAH analytical data from 18 parcels at FTMC that were determined to represent anthropogenic activity (IT, 2000b). PAH background screening values were developed for two categories of surface soils: beneath asphalt and adjacent to asphalt. The PAH background screening values for soils adjacent to asphalt are the more conservative (i.e., lower) of the PAH background values and are the values used herein for comparison.

Six compounds were quantified by both SW-846 Method 8260B (as VOC) and Method 8270C (as SVOC), namely, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 1,3-dichlorobenzene, 1,2-dichlorobenzene, hexachlorobutadiene, and naphthalene. Method 8260B yields a reporting limit of 0.005 milligrams per kilogram (mg/kg), while Method 8270C has a reporting limit of 0.330 mg/kg, which is typical for a soil matrix sample. Because of the direct nature of the Method 8260B analysis and its resulting lower reporting limit, this method should be considered superior to Method 8270C when quantifying low levels (0.005 to 0.330 mg/kg) of these compounds. Method 8270C and its associated methylene chloride extraction step is superior, however, when dealing with samples that contain higher concentrations (greater than 0.330 mg/kg) of these compounds. Therefore, all data were considered, and none were categorically excluded. Data validation qualifiers were helpful in evaluating the usability of data, especially if calibration, blank contamination, precision, or accuracy indicator anomalies were encountered. The validation qualifiers and concentrations reported (e.g., whether concentrations were less than or

greater than 0.330 mg/kg) were used to determine which analytical method was likely to return the more accurate result.

The following sections and Tables 5-1 through 5-4 summarize the results of the comparison of detected constituents to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix D.

5.1 Surface Soil Analytical Results

Four surface soil samples were collected for chemical analysis at the Former Printing Plant, Building 1060, Parcel 172(7). Surface soil samples were collected from the upper 1 foot of soil at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs, ESVs, and background screening values (metals and PAHs), as presented in Table 5-1.

Metals. Nineteen metals were detected in surface soil samples collected at the Former Printing Plant, Building 1060, Parcel 172(7). With the exceptions of potassium and selenium, the detected metals were present in each of the samples. The sodium results and two of the beryllium results were flagged with a "B" data qualifier, signifying that these metals were also detected in an associated laboratory or field blank sample.

The concentrations of arsenic (four locations), chromium (PPMP-172-GP02 and PPMP-172-GP04), iron (four locations), and manganese (PPMP-172-GP03) exceeded residential human health SSSLs. With the exception of arsenic and manganese at one location (PPMP-172-GP03), the concentrations of these metals were below their respective background concentrations. The arsenic and manganese results at PPMP-172-GP03 were within the range of background values determined by SAIC (1998), (Appendix F).

Aluminum (four locations), arsenic (PPMP-172-GP02 and PPMP-172-GP03), chromium (four locations), iron (four locations), lead (PPMP-172-GP03), manganese (PPMP-172-GP01 and PPMP-172-GP03), mercury (PPMP-172-GP02 and PPMP-172-GP03), selenium (PPMP-172-GP02 and PPMP-172-GP03), vanadium (four locations), and zinc (PPMP-172-GP02) concentrations exceeded ESVs. With the exception selenium at one location (PPMP-172-GP02), the concentrations of these metals were below their respective background concentration or within the range of background values.

Table 5-1

Surface Soil Analytical Results
Former Printing Plant, Building 1060, Parcel 172(7)
Fort McClellan, Calhoun County, Alabama

Parcel					PPMP-172					PPMP-172					PPMP-172					PPMP-172				
Sample Location					PPMP-172-GP01					PPMP-172-GP02					PPMP-172-GP03					PPMP-172-GP04				
Sample Number					KW0001					KW0005					KW0007					KW0009				
Sample Date					2-Feb-99					1-Feb-99					1-Feb-99					1-Feb-99				
Sample Depth (Feet)					0- 1					0- 1					0- 1					0- 1				
Parameter	**Units**	**BKG[a]**	**SSSL[b]**	**ESV[b]**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**
METALS																								
Aluminum	mg/kg	1.63E+04	7.80E+03	5.00E+01	4.81E+03				YES	7.22E+03				YES	6.63E+03				YES	5.07E+03				YES
Arsenic	mg/kg	1.37E+01	4.26E-01	1.00E+01	8.10E+00			YES		1.12E+01			YES	YES	1.64E+01		YES	YES	YES	2.50E+00			YES	
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	2.47E+01					1.48E+01	J				8.15E+01					1.85E+01	J			
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	2.70E-01	B				1.30E-01	B				5.50E-01	J				4.20E-01	J			
Calcium	mg/kg	1.72E+03	NA	NA	3.42E+02	J				1.70E+03					1.20E+03					2.01E+04		YES		
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	9.10E+00				YES	2.44E+01			YES	YES	1.24E+01				YES	2.54E+01			YES	YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	1.70E+00	J				8.80E-01	J				9.80E+00					1.00E+00	J			
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	5.80E+00					1.42E+01		YES			5.50E+00					2.50E+00	J			
Iron	mg/kg	3.42E+04	2.34E+03	2.00E+02	1.12E+04			YES	YES	2.81E+04			YES	YES	1.38E+04			YES	YES	6.29E+03			YES	YES
Lead	mg/kg	4.01E+01	4.00E+02	5.00E+01	1.69E+01	J				2.35E+01	J				5.91E+01	J	YES		YES	3.20E+00	J			
Magnesium	mg/kg	1.03E+03	NA	4.40E+05	2.14E+02	J				1.91E+02	J				2.12E+02	J				8.36E+03		YES		
Manganese	mg/kg	1.58E+03	3.63E+02	1.00E+02	3.31E+02				YES	4.54E+01					2.47E+03		YES	YES	YES	8.58E+01				
Mercury	mg/kg	8.00E-02	2.33E+00	1.00E-01	6.10E-02					2.90E-01		YES		YES	2.00E-01		YES		YES	2.30E-02	J			
Nickel	mg/kg	1.03E+01	1.54E+02	3.00E+01	2.40E+00	J				2.10E+00	J				4.20E+00	J				1.08E+01		YES		
Potassium	mg/kg	8.00E+02	NA	NA	ND					1.00E+02	J				ND					4.13E+02	J			
Selenium	mg/kg	4.80E-01	3.91E+01	8.10E-01	6.40E-01		YES			1.60E+00		YES		YES	1.30E+00		YES		YES	ND				
Sodium	mg/kg	6.34E+02	NA	NA	6.62E+01	B				9.69E+01	B				8.25E+01	B				1.12E+02	B			
Vanadium	mg/kg	5.88E+01	5.31E+01	2.00E+00	1.75E+01				YES	3.99E+01				YES	2.18E+01				YES	1.53E+01				YES
Zinc	mg/kg	4.06E+01	2.34E+03	5.00E+01	7.20E+00	J				6.95E+01	J	YES		YES	3.23E+01	J				5.20E+00	J			
VOLATILE ORGANIC COMPOUNDS																								
Acetone	mg/kg	NA	7.76E+02	2.50E+00	8.00E-03	B				2.00E-02	B				ND					9.30E-03	B			
Methylene chloride	mg/kg	NA	8.41E+01	2.00E+00	4.40E-03	B				4.30E-03	B				4.10E-03	B				3.60E-03	B			
Naphthalene	mg/kg	NA	1.55E+02	1.00E-01	ND					2.80E-03	J				7.50E-02					ND				
SEMIVOLATILE ORGANIC COMPOUNDS																								
2-Methylnaphthalene	mg/kg	NA	1.55E+02	NA	ND					1.10E-01	J				1.00E+00					ND				
4-Methylphenol	mg/kg	NA	3.88E+01	5.00E-01	ND					ND					1.10E-01	J				ND				
Acenaphthene	mg/kg	7.02E-01	4.63E+02	2.00E+01	ND					7.10E-01		YES			4.20E+00		YES			ND				
Acenaphthylene	mg/kg	8.91E-01	4.63E+02	6.82E+02	ND					ND					1.60E-01	J				ND				
Anthracene	mg/kg	9.35E-01	2.33E+03	1.00E-01	ND					8.00E-01				YES	3.80E+00		YES		YES	ND				
Benzo(a)anthracene	mg/kg	1.19E+00	8.51E-01	5.21E+00	3.60E-02	J				2.30E+00		YES	YES		1.10E+01		YES	YES	YES	ND				
Benzo(a)pyrene	mg/kg	1.42E+00	8.51E-02	1.00E-01	4.00E-02	J				2.10E+00		YES	YES	YES	9.40E+00		YES	YES	YES	ND				
Benzo(b)fluoranthene	mg/kg	1.66E+00	8.51E-01	5.98E+01	3.90E-02	J				2.20E+00		YES	YES		1.00E+01		YES	YES		ND				
Benzo(ghi)perylene	mg/kg	9.55E-01	2.32E+02	1.19E+02	ND					1.30E+00		YES			2.60E+00		YES			ND				
Benzo(k)fluoranthene	mg/kg	1.45E+00	8.51E+00	1.48E+02	ND					1.70E+00		YES			9.90E+00		YES	YES		ND				
Butyl benzyl phthalate	mg/kg	NA	1.56E+03	2.40E-01	ND					ND					4.80E-02	J				ND				
Carbazole	mg/kg	NA	3.11E+01	NA	ND					2.20E+00	J				1.40E+01	J				ND				
Chrysene	mg/kg	1.40E+00	8.61E+01	4.73E+00	4.40E-02	J				2.20E+00		YES			1.00E+01		YES		YES	ND				
Di-n-butyl phthalate	mg/kg	NA	7.80E+02	2.00E+02	ND					8.10E-02	J				ND					ND				
Dibenz(a,h)anthracene	mg/kg	7.20E-01	8.61E-02	1.84E+01	ND					6.10E-01			YES		1.60E+00		YES	YES		ND				
Dibenzofuran	mg/kg	NA	3.09E+01	NA	ND					2.60E-01	J				1.90E+00					ND				
Fluoranthene	mg/kg	2.03E+00	3.09E+02	1.00E-01	8.10E-02	J				5.90E+00		YES		YES	2.80E+01		YES		YES	ND				
Fluorene	mg/kg	6.67E-01	3.09E+02	1.22E+02	ND					5.20E-01					3.60E+00		YES			ND				
Indeno(1,2,3-cd)pyrene	mg/kg	9.37E-01	8.51E-01	1.09E+02	ND					1.20E+00		YES	YES		3.00E+00		YES	YES		ND				
Naphthalene	mg/kg	3.30E-02	1.55E+02	1.00E-01	ND					3.80E-01	J	YES		YES	4.50E+00		YES		YES	ND				
Phenanthrene	mg/kg	1.08E+00	2.32E+03	1.00E-01	4.00E-02	J				4.70E+00		YES		YES	2.70E+01		YES		YES	ND				
Phenol	mg/kg	NA	4.66E+03	5.00E-02	ND					ND					5.20E-02	J			YES	ND				
Pyrene	mg/kg	1.63E+00	2.33E+02	1.00E-01	6.30E-02	J				3.90E+00		YES		YES	1.90E+01		YES		YES	ND				
bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	9.30E-01	7.30E-02	B				6.30E-02	B				ND					ND				

Table 5-1

Surface Soil Analytical Results
Former Printing Plant, Building 1060, Parcel 172(7)
Fort McClellan, Calhoun County, Alabama

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

[a] Bkg - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama,* July. For SVOCs, value listed is the background screening criterion for soils adjacent to asphalt as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama,* July.

[b] Residential human health site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama,* July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).
J - Result is greater than the method detection limit but less than or equal to the reporting limit.
mg/kg - Milligrams per kilogram.
NA - Not available.
ND - Not detected.
Qual - Data validation qualifier.

Table 5-2

Subsurface Soil Analytical Results
Former Printing Plant, Building 1060, Parcel 172(7)
Fort McClellan, Calhoun County, Alabama

Parcel				PPMP-172				PPMP-172				PPMP-172				PPMP-172			
Sample Location				PPMP-172-GP01				PPMP-172-GP02				PPMP-172-GP03				PPMP-172-GP04			
Sample Number				KW0004				KW0006				KW0008				KW0010			
Sample Date				2-Feb-99				1-Feb-99				1-Feb-99				1-Feb-99			
Sample Depth (Feet)				9-12				9-12				3-6				3-6			
Parameter	**Units**	**BKG[a]**	**SSSL[b]**	**Result**	**Qual**	**>BKG**	**>SSSL**	**Result**	**Qual**	**>BKG**	**>SSSL**	**Result**	**Qual**	**>BKG**	**>SSSL**	**Result**	**Qual**	**>BKG**	**>SSSL**
METALS																			
Aluminum	mg/kg	1.36E+04	7.80E+03	8.24E+03			YES	8.39E+03			YES	6.16E+03				6.77E+03			
Arsenic	mg/kg	1.83E+01	4.26E-01	5.20E+00			YES	5.80E+00			YES	6.00E+00			YES	5.40E+00			YES
Barium	mg/kg	2.34E+02	5.47E+02	1.96E+01	J			2.28E+01	J			9.30E+00	J			7.00E+00	J		
Beryllium	mg/kg	8.60E-01	9.60E+00	8.40E-01				1.10E+00		YES		8.70E-02	B			1.30E-01	B		
Calcium	mg/kg	6.37E+02	NA	2.12E+01	J			3.92E+01	J			1.47E+02	J			1.25E+02	J		
Chromium	mg/kg	3.83E+01	2.32E+01	3.35E+01			YES	1.84E+01				3.39E+01			YES	2.80E+01			YES
Cobalt	mg/kg	1.75E+01	4.68E+02	9.80E-01	J			2.10E+00	J			ND				ND			
Copper	mg/kg	1.94E+01	3.13E+02	3.97E+01		YES		3.17E+01		YES		6.00E+00				5.20E+00			
Iron	mg/kg	4.48E+04	2.34E+03	5.10E+04		YES	YES	3.95E+04			YES	3.84E+04			YES	4.08E+04			YES
Lead	mg/kg	3.85E+01	4.00E+02	1.69E+01	J			2.04E+01	J			9.00E+00	J			6.10E+00	J		
Magnesium	mg/kg	7.66E+02	NA	9.09E+01	J			1.84E+02	J			5.12E+01	J			8.10E+01	J		
Manganese	mg/kg	1.36E+03	3.63E+02	1.00E+01				4.86E+01				1.50E+00	J			1.30E+00	J		
Mercury	mg/kg	7.00E-02	2.33E+00	1.40E-02	B			2.50E-02	J			1.70E-02	B			4.10E-02			
Nickel	mg/kg	1.29E+01	1.54E+02	9.90E+00				1.38E+01		YES		ND				ND			
Potassium	mg/kg	7.11E+02	NA	4.16E+02	J			3.42E+02	J			1.42E+02	J			ND			
Selenium	mg/kg	4.70E-01	3.91E+01	2.50E+00		YES		2.00E+00		YES		2.50E+00		YES		2.60E+00		YES	
Sodium	mg/kg	7.02E+02	NA	8.28E+01	B			7.18E+01	B			5.65E+01	B			5.62E+01	B		
Thallium	mg/kg	1.40E+00	5.08E-01	4.50E-01	J			ND				ND				ND			
Vanadium	mg/kg	6.49E+01	5.31E+01	3.91E+01				2.68E+01				5.66E+01			YES	3.72E+01			
Zinc	mg/kg	3.49E+01	2.34E+03	2.42E+01	J			3.67E+01	J	YES		1.20E+00	J			2.50E+00	J		
VOLATILE ORGANIC COMPOUNDS																			
Acetone	mg/kg	NA	7.76E+02	3.90E-02	B			2.40E-01	B			7.10E-02	B			1.80E-02	B		
Methylene chloride	mg/kg	NA	8.41E+01	4.40E-03	B			4.40E-03	B			4.90E-03	B			4.00E-03	B		
Naphthalene	mg/kg	NA	1.55E+02	ND				ND				3.70E-03	J			ND			
SEMIVOLATILE ORGANIC COMPOUNDS																			
Acenaphthene	mg/kg	NA	4.63E+02	ND				4.10E-02	J			ND				ND			
Anthracene	mg/kg	NA	2.33E+03	ND				4.80E-02	J			ND				ND			
Benzo(a)anthracene	mg/kg	NA	8.51E-01	ND				1.40E-01	J			ND				ND			
Benzo(a)pyrene	mg/kg	NA	8.51E-02	ND				1.20E-01	J		YES	ND				ND			
Benzo(b)fluoranthene	mg/kg	NA	8.51E-01	ND				1.30E-01	J			ND				ND			
Benzo(ghi)perylene	mg/kg	NA	2.32E+02	ND				1.00E-01	J			ND				ND			
Benzo(k)fluoranthene	mg/kg	NA	8.51E+00	ND				1.40E-01	J			ND				ND			
Carbazole	mg/kg	NA	3.11E+01	ND				1.50E-01	J			ND				ND			
Chrysene	mg/kg	NA	8.61E+01	ND				1.50E-01	J			ND				ND			
Dibenz(a,h)anthracene	mg/kg	NA	8.61E-02	ND				4.20E-02	J			ND				ND			
Fluoranthene	mg/kg	NA	3.09E+02	ND				3.70E-01	J			ND				ND			
Indeno(1,2,3-cd)pyrene	mg/kg	NA	8.51E-01	ND				9.40E-02	J			ND				ND			
Phenanthrene	mg/kg	NA	2.32E+03	ND				2.70E-01	J			ND				ND			
Pyrene	mg/kg	NA	2.33E+02	ND				2.70E-01	J			ND				ND			
bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	6.70E-02	B			ND				ND				ND			

Table 5-2

Subsurface Soil Analytical Results
Former Printing Plant, Building 1060, Parcel 172(7)
Fort McClellan, Calhoun County, Alabama

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

[a] Bkg - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama,* July.

[b] Residential human health site-specific screening level (SSSL) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama,* July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).
J - Result is greater than the method detection limit but less than or equal to the reporting limit.
mg/kg - Milligrams per kilogram.
NA - Not available.
ND - Not detected.
Qual - Data validation qualifier.

Table 5-3

Surface Water Analytical Results
Former Printing Plant, Building 1060, Parcel 172(7)
Fort McClellan, Calhoun County, Alabama

Parcel / Sample Location / Sample Number / Sample Date					PPMP-172 / PPMP-172-SEP01* / KW2001 / 10-Feb-99				
Parameter	**Units**	**BKG[a]**	**SSSL[b]**	**ESV[b]**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**
METALS									
Aluminum	mg/L	5.26E+00	1.53E+01	8.70E-02	4.28E-01				YES
Arsenic	mg/L	2.10E-03	7.30E-04	1.90E-01	9.60E-03	J	YES	YES	
Barium	mg/L	7.53E-02	1.10E+00	3.90E-03	1.52E-02	J			YES
Calcium	mg/L	2.52E+01	NA	1.16E+02	8.81E+00				
Copper	mg/L	1.27E-02	6.23E-01	6.54E-03	5.90E-03	B			
Iron	mg/L	1.96E+01	4.70E+00	1.00E+00	5.94E-01	J			
Magnesium	mg/L	1.10E+01	NA	8.20E+01	3.54E+00	J			
Manganese	mg/L	5.65E-01	6.40E-01	8.00E-02	1.76E-02				
Mercury	mg/L	NA	4.25E-03	1.00E-05	6.90E-05	J			YES
Potassium	mg/L	2.56E+00	NA	5.30E+01	2.23E+00	J			
Sodium	mg/L	3.44E+00	NA	6.80E+02	1.61E+00	B			
VOLATILE ORGANIC COMPOUNDS									
Acetone	mg/L	NA	1.57E+00	7.80E+01	2.70E-03	B			

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

* PPMP-172-SEP01 collected from surface water runoff accumulation area.

[a] Bkg - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama,* July.

[b] Recreational site user site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama,* July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).

J - Result is greater than the method detection limit but less than or equal to the reporting limit.

mg/L - Milligrams per liter.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 5-4

Sediment Analytical Results
Former Printing Plant, Building 1060, Parcel 172(7)
Fort McClellan, Calhoun County, Alabama

Parcel					PPMP-172				
Sample Location					PPMP-172-SD01				
Sample Number					KW1001				
Sample Date					10-Feb-99				
Sample Depth (Feet)					0- .5				
Parameter	**Units**	**BKG[a]**	**SSSL[b]**	**ESV[b]**	**Result**	**Qual**	**>BKG**	**>SSSL**	**>ESV**
METALS									
Aluminum	mg/kg	8.59E+03	1.15E+06	NA	4.72E+03				
Arsenic	mg/kg	1.13E+01	5.58E+01	7.24E+00	3.81E+01		YES		YES
Barium	mg/kg	9.89E+01	8.36E+04	NA	4.38E+01				
Beryllium	mg/kg	9.70E-01	1.50E+02	NA	5.00E-01	J			
Calcium	mg/kg	1.11E+03	NA	NA	2.48E+03		YES		
Chromium	mg/kg	3.12E+01	2.79E+03	5.23E+01	7.30E+00				
Cobalt	mg/kg	1.10E+01	6.72E+04	5.00E+01	5.50E+00	J			
Copper	mg/kg	1.71E+01	4.74E+04	1.87E+01	1.52E+01				
Iron	mg/kg	3.53E+04	3.59E+05	NA	1.43E+04				
Lead	mg/kg	3.78E+01	4.00E+02	3.02E+01	2.53E+01				
Magnesium	mg/kg	9.06E+02	NA	NA	1.19E+03		YES		
Manganese	mg/kg	7.12E+02	4.38E+04	NA	3.58E+02				
Mercury	mg/kg	1.10E-01	2.99E+02	1.30E-01	1.10E-01		YES		
Nickel	mg/kg	1.30E+01	1.76E+04	1.59E+01	8.80E+00				
Potassium	mg/kg	1.01E+03	NA	NA	3.59E+02	J			
Selenium	mg/kg	7.20E-01	5.96E+03	NA	1.20E+00		YES		
Sodium	mg/kg	6.92E+02	NA	NA	7.89E+01	B			
Vanadium	mg/kg	4.09E+01	4.83E+03	NA	1.37E+01				
Zinc	mg/kg	5.27E+01	3.44E+05	1.24E+02	6.38E+01		YES		
VOLATILE ORGANIC COMPOUNDS									
Acetone	mg/kg	NA	1.03E+05	4.53E-01	2.20E-02	B			
Methylene chloride	mg/kg	NA	9.84E+03	1.26E+00	7.50E-03	B			
SEMIVOLATILE ORGANIC COMPOUNDS									
Fluoranthene	mg/kg	NA	3.73E+04	3.30E-01	6.60E-02	J			
bis(2-Ethylhexyl)phthalate	mg/kg	NA	5.41E+03	1.82E-01	1.10E-01	B			

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

[a] Bkg - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama,* July.

[b] Recreational site user site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama,* July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).

J - Result is greater than stated method detection limit but less than or equal to specified reporting limit.

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Volatile Organic Compounds. Three VOCs (acetone, methylene chloride, and naphthalene) were detected in surface soil samples collected at the Former Printing Plant, Building 1060, Parcel 172(7). The acetone and methylene chloride results were flagged with a "B" data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample.

The VOC concentrations in surface soils were below SSSLs and ESVs.

Semivolatile Organic Compounds. Twenty-four SVOCs including sixteen PAH compounds, were detected in surface soil samples collected at the Former Printing Plant, Building 1060, Parcel 172(7). SVOCs were not detected in the soils collected at PPMP-172-GP04. Sample locations PPMP-172-GP03 and PPMP-172-GP02 contained 21 and 20 SVOCs, respectively, of the 24 detected SVOCs.

The concentrations of six PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) exceeded SSSLs and PAH background values at sample locations PPMP-172-GP02 and/or PPMP-172-GP03. The PAH concentrations exceeding SSSLs ranged from 0.61 mg/kg to 11 mg/kg.

The concentrations of nine SVOCs, including eight PAH compounds and one non-PAH compound (phenol), exceeded ESVs at two sample locations (PPMP-172-GP02 and PPMP-172-GP03). With the exception of anthracene at PPMP-172-GP02, the PAH results that exceeded SSSLs at these two sample locations also exceeded PAH background values. The concentrations of the SVOCs that exceeded ESVs ranged from 0.05 mg/kg to 28 mg/kg (the PAH compound fluoranthene was detected at a concentration of 28 mg/kg).

5.2 Subsurface Soil Analytical Results

Four subsurface soil samples were collected for chemical analysis at the Former Printing Plant, Building 1060, Parcel 172(7). Subsurface soil samples were collected at depths greater than 1 foot bgs at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and background screening values, as presented in Table 5-2.

Metals. Twenty metals were detected in subsurface soil samples collected at the Former Printing Plant, Building 1060, Parcel 172(7). The concentrations of five metals (aluminum, arsenic, chromium, iron, and vanadium) exceeded residential human health SSSLs. With the exception of iron at one location (PPMP-172-GP01), the concentrations of these metals were below their respective background concentrations (Appendix F). The iron result (51,000 mg/kg) exceeded the range of background values for iron (4,840 to 48,000 mg/kg).

Volatile Organic Compounds. Three VOCs (acetone, methylene chloride, and naphthalene) were detected in subsurface soil samples collected at the Former Printing Plant, Building 1060, Parcel 172(7). The acetone and methylene chloride analytical results were flagged with a "B" data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample.

The VOC concentrations in subsurface soils were below SSSLs and.

Semivolatile Organic Compounds. Fifteen SVOCs, including thirteen PAH compounds, were detected in subsurface soil samples collected at the Former Printing Plant, Building 1060, Parcel 172(7). SVOCs were not detected at two sample locations (PPMP-172-GP03 and PPMP-172-GP04), and only one SVOC (bis[2-ethylhexyl]phthalate) was detected at sample location PPMP-172-GP01. Sample location PPMP-172-GP02 contained 14 of the 15 detected SVOCs. The bis(2-ethylhexyl)phthalate analytical result was flagged with a "B" data qualifier, signifying that bis(2-ethylhexyl)phthalate was also detected in an associated laboratory or field blank sample.

Benzo(a)pyrene was detected in PPMP-172-GP02 at a concentration of (0.12 mg/kg) exceeding the SSSL (0.085 mg/kg).

5.3 Surface Water Analytical Results

One surface water sample was collected for chemical analysis at the Former Printing Plant, Building 1060, Parcel 172(7), at the location shown on Figure 3-1. Analytical results were compared to recreational site-user human health SSSLs, ESVs, and background screening values, as presented in Table 5-3.

Metals. Eleven metals were detected in the surface water sample collected at the Former Printing Plant, Building 1060, Parcel 172(7).

Arsenic was detected at a concentration exceeding the SSSL and its respective background concentration in the surface water sample collected at the Former Printing Plant, Building 1060, Parcel 172(7). However, the arsenic concentration was within the range of background values determined by SAIC (1998) (Appendix F).

Aluminum, barium, and mercury concentrations exceeded ESVs. The aluminum and barium results were below their respective background concentrations. A background concentration for mercury was not available in the background metals survey (SAIC, 1998).

Volatile Organic Compounds. Acetone was detected in the surface water sample collected at the Former Printing Plant, Building 1060, Parcel 172(7). The acetone analytical result was flagged with a "B" data qualifier, signifying that this compound was also detected in an associated laboratory or field blank sample. The acetone concentration was below the SSSL and ESV.

Semivolatile Organic Compounds. SVOCs were not detected in the surface water sample collected at the Former Printing Plant, Building 1060, Parcel 172(7).

5.4 Sediment Analytical Results

One sediment sample was collected for chemical and physical analyses at the Former Printing Plant, Building 1060, Parcel 172(7), at the location shown on Figure 3-1. Analytical results were compared to recreational site-user human health SSSLs, ESVs, and background concentrations, as presented in Table 5-4.

Metals. Nineteen metals were detected in the sediment sample collected at the Former Printing Plant, Building 1060, Parcel 172(7). None of the metals was detected at a concentration exceeding recreational site-user human health SSSLs. The arsenic concentration (38.1 mg/kg) exceeded the ESV (7.24 mg/kg), its respective background concentration (11.3 mg/kg), and the range of background values (0.21 to 20 mg/kg) (Appendix F).

Volatile Organic Compounds. Acetone and methylene chloride were detected in the sediment sample collected at the Former Printing Plant, Building 1060, Parcel 172(7). The

analytical results were flagged with a “B” data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample. The acetone and methylene chloride concentrations were below SSSLs and ESVs.

Semivolatile Organic Compounds. Fluoranthene and bis(2-ethylhexyl)phthalate were detected in the sediment sample collected at the Former Printing Plant, Building 1060, Parcel 172(7). The bis(2-ethylhexyl)phthalate result was flagged with a “B” data qualifier, signifying that bis(2-ethylhexyl)phthalate was also detected in an associated laboratory or field blank sample. The fluoranthene and bis(2-ethylhexl)phthalate results were below SSSLs and ESVs.

Total Organic Carbon. The sediment sample was analyzed for TOC content. The TOC concentration in PPMP-172-SW/SD01 was 56,800 mg/kg, as summarized in Appendix D.

Grain Size. The result of the grain size analysis for the sediment sample is included in Appendix D.

6.0 Summary, Conclusions, and Recommendations

IT, under contract with USACE, completed an SI at the Former Printing Plant, Building 1060, Parcel 172(7), at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site and, if present, whether the concentrations present an unacceptable risk to human health or the environment. The SI at the Former Printing Plant, Building 1060, Parcel 172(7), consisted of the sampling and analysis of four surface soil samples, four subsurface soil samples, one surface water sample, and one sediment sample.

The analytical results indicate that metals, VOCs and SVOCs were detected in the environmental media sampled. Analytical results were compared to the human health SSSLs and ESVs. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC. Additionally, metals results exceeding the SSSLs and ESVs were compared to media-specific background concentrations (SAIC, 1998), and PAH concentrations exceeding SSSLs and ESVs in surface soils were compared to PAH background screening values (IT, 2000b).

The potential impact to human receptors is expected to be minimal. Although the site is projected to be transferred to the Alabama National Guard, the soils data were screened against residential human health SSSLs to evaluate the site for possible unrestricted future use. With the exception of iron in one subsurface soil sample, the metals that exceeded SSSLs were below their respective background concentrations or within the range of background values and thus do not pose an unacceptable risk to future human receptors. Six PAH compounds were detected in two surface soil samples at concentrations exceeding SSSLs and PAH background values. In addition, one PAH compound (benzo[a]pyrene) exceeded the SSSL in one subsurface soil sample. The concentrations of the PAHs exceeding SSSLs ranged from 0.12 mg/kg to 11 mg/kg.

Several metals were detected in site media at concentrations exceeding ESVs and background concentrations. In addition, the concentrations of eight PAH compounds exceeded ESVs at two sampling locations. However, the potential impact to ecological receptors is expected to be minimal. The site is located in a well-developed area of the Main Post consisting of buildings and paved roads and is projected for future use by the Alabama National Guard. Consequently, the threat to potential ecological receptors is expected to be low.

Based on the results of the SI, past operations at the Former Printing Plant, Building 1060, Parcel 172(7), do not appear to have adversely impacted the environment. The metals and organic compounds detected in site media do not pose an unacceptable risk to human health or the environment. Therefore, IT recommends "No Further Action" and unrestricted land reuse at the Former Printing Plant, Building 1060, Parcel 172(7).

7.0 References

Cloud, P. E., Jr., 1966, ***Bauxite Deposits of the Anniston, Fort Payne, and Ashville Areas, Northeast Alabama***, U. S. Geological Survey Bulletin 1199-O, 35p.

Environmental Science and Engineering, Inc. (ESE), 1998, ***Final Environmental Baseline Survey, Fort McClellan, Alabama***, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, January.

IT Corporation (IT), 2000a, ***Final Installation-Wide Sampling and Analysis Plan, Fort McClellan, Calhoun County, Alabama***, March.

IT Corporation (IT), 2000b, ***Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama***, July.

IT Corporation (IT), 1998a, ***Final Site-Specific Field Sampling Plan Attachment Site Investigation at the Former Printing Plant, Building 1060, Parcel 172(7), Fort McClellan, Calhoun County, Alabama***, December.

IT Corporation (IT), 1998b, ***Final Installation-Wide Work Plan, Fort McClellan, Calhoun County, Alabama***, August.

Moser, P. H. and S.S. DeJarnette, 1992, ***Groundwater Availability in Calhoun County, Alabama***, Geological Survey of Alabama Special Map 228.

Osborne, W. E., 1999, Personal Communication with John Hofer, IT Corporation.

Osborne, W. E., and Szabo, M. W., 1984, ***Stratigraphy and Structure of the Jacksonville Fault, Calhoun County, Alabama***, Alabama Geological Survey Circular 117.

Osborne, W. E., Irving, G. D., and Ward, W. E., 1997, ***Geologic Map of the Anniston 7.5' Quadrangle, Calhoun County, Alabama***, Alabama Geologic Survey Preliminary Map, 1 sheet.

Osborne, W. E., Szabo, M. W., Copeland, C. W. Jr., and Neathery, T. L., 1989, ***Geologic Map of Alabama***, Alabama Geologic Survey Special Map 221, scale 1:500,000, 1 sheet.

Science Applications International Corporation, 1998, ***Final Background Metals Survey Report, Fort McClellan, Alabama***, July.

Szabo, M. W., Osborne, W. E., Copeland, C. W., Jr., and Neathery, T. L., compilers, 1988, ***Geologic Map of Alabama***, Alabama Geological Survey Special Map 220, scale 1:250,000, 5 sheets.

U.S. Army Corps of Engineers (USACE), 1994, ***Requirements for the Preparation of Sampling and Analysis Plans***, Engineer Manual EM 200-1-3, September.

U.S. Department of Agriculture (USDA), 1961, ***Soil Survey, Calhoun County, Alabama***, Soil Conservation Service, Series 1958, No. 9, September.

Warman, J. C, and Causey, L. V., 1962, ***Geology and Ground-water Resources of Calhoun County, Alabama***, Alabama Geological Survey County Report 7, 77 p.

ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

APPENDIX A

SAMPLE COLLECTION LOGS
ANALYSIS REQUEST/CHAIN-OF-CUSTODY RECORDS

APPENDIX B

BORING LOGS

APPENDIX C

SURVEY DATA

APPENDIX D

SUMMARY OF VALIDATED ANALYTICAL DATA

APPENDIX E

DATA VALIDATION SUMMARY REPORT

APPENDIX F

SUMMARY STATISTICS FOR BACKGROUND MEDIA FORT McCLELLAN, ALABAMA